

Paper Title:

CERES FM-5 on the NPP Spacecraft: Continuing the Earth Radiation Budget Climate Data Record

Authors:

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Bio:

Kory Priestley is a Research Scientist in the Climate Science Branch of NASA's Langley Research Center. He is a co-investigator on the CERES Science Team and serves as the chair of the Science Team's Instrument Working Group. In this capacity he is responsible for the radiometric performance of all CERES Flight Hardware. Kory received his PhD from Virginia Tech in the field of Mechanical Engineering in 1997. He has worked at NASA Langley Research Center since 1995.

Abstract:

The Clouds and the Earth's Radiant Energy System (CERES) Flight Model-5 (FM-5) instrument will fly on the NPOESS Preparatory Project (NPP) spacecraft, which has a launch-readiness date in June, 2010. This mission will continue the critical Earth Radiation Budget Climate Data Record (CDR) begun by the Earth Radiation Budget Experiment (ERBE) instruments in the mid 1980's and continued by the CERES instruments currently flying on the EOS Terra and Aqua spacecraft. Ground calibrations have been completed for FM-5 and the instrument has been delivered for integration to the spacecraft. Rigorous pre-launch ground calibration is performed on each CERES unit to achieve an accuracy goal of 1% for SW flux and 0.5% for outgoing LW flux. Any ground to flight or in-flight changes in radiometer response is monitored using a protocol employing both onboard and vicarious calibration sources and experiments. Recent studies of FM-1 through FM-4 data have shown that the SW response of space based broadband radiometers can change dramatically due to optical contamination. With these changes having most impact on optical response to blue-to UV radiance, where tungsten lamps are largely devoid of output, such changes are hard to monitor accurately using existing on-board sources. This paper outlines the lessons learned on the existing CERES sensors from 30+ years of flight experience and presents a radiometric protocol to be implemented on the FM-5 instrument to ensure that its performance exceeds the stated calibration and stability goals.

Short Abstract:

The Clouds and the Earth's Radiant Energy System (CERES) Flight Model-5 (FM-5) instrument will fly on the NPOESS Preparatory Project spacecraft, which has a launch-readiness date in June, 2010. This mission continues the critical Earth Radiation Budget Climate Data Record begun by the Earth Radiation Budget Experiment instruments in the mid 1980's and continued by the CERES instruments currently flying on the Terra and Aqua spacecraft. This paper outlines lessons learned on the existing CERES instruments from 30+ years of flight experience and presents a radiometric protocol to ensure that the FM-5 instrument performance exceeds the calibration and stability goals.

Keywords:

CERES, Calibration, Radiometry, EOS, NPP, Earth Radiation Budget, Spectral Darkening, Optical Contamination